AN INVESTIGATION OF THE SOOTY MOULDS OF NEW SOUTH WALES. IV.

THE SPECIES OF THE EUCAPNODIEAE.

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(Ninety-one Text-figures.)

[Read 29th May, 1935.]

When this investigation was commenced the number of authentic species of the Capnodiaceae known to occur in New South Wales was four (Fraser, 1933). In this and the following paper fourteen new species and varieties are described, and emended descriptions are given of a number of incompletely known types. Theissen and Sydow (1917) divided the family Capnodiaceae into sub-sections, the Eucapnodieae and the Chaetothyrieae. The present paper deals with the species of the Eucapnodieae.

All the fungi belonging to this section produce some kind of pycnidial fruit. A difficulty encountered in the descriptions of the species was the correlation of the pycnidia with the proper ascogenous fructifications. In the past many species have been described as having a number of different kinds of pycnidial fruits, as well as conidia of various types such as *Triposporium* and *Helminthosporium*. It is now generally realized that only one kind of pycnidial fruit is produced by any member of the Capnodiaceae, and that the different types of conidia are produced by members of the Fungi Imperfecti growing in association with it. In many cases several species of Capnodium may grow together in the one sooty mould, and pure culture methods are necessary to establish their relationships.

Cultures have been made from all the types of fructifications herein described, and the pycnidia and ascostromata were correlated only after they had been proved culturally to have been produced by the same fungus.

Ascospore cultures were obtained by crushing the ascostromata and picking out the ascopores by means of a dry needle. The pycnidia were kept in a damp atmosphere, e.g. in a petri dish with a few drops of water on the bottom. The mucilage in the pycnidia then absorbed water and swelled, bulging out the mouth of the pycnidium and carrying with it a number of spores. This clear drop of mucilage hung at the apex of the pycnidium and was readily picked off with a sterile needle.

When the mycelium of the sooty mould is very distinctive, as in *Capnodium elegans* and *C. moniliforme*, the need for culturally relating the different fructifications does not arise.

Capnodium salicinum Mont.

Ann. Sci. Nat., 3rd Sér., xi, p. 233, 1849.

Evidence has been advanced in a previous paper to show that the generic name *Capnodium* should not be superseded by *Teichospora* as maintained by Arnaud (1910) and Gaumann (1928).

In New South Wales the typical form produces 4-celled brown pycnidiospores (rarely 2- or 7-celled), which are 12–18 × 5–9μ, the average size being 15 × 8μ. These pycnidiospores resemble the ascopores to a certain extent (Text-fig. 1).

The ascospores are often slightly constricted at the middle septum (Text-fig. 2). The ascostromata may be shortly stalked or almost sessile, the length evidently depending on the environmental conditions. An interesting variant (Text-fig. 2*a* and *b*) collected at Nowra developed stalks up to 250μ long, but was otherwise typical.

C. callitris McAlp. (McAlpine, 1896*b*) differs from typical *C. salicinum* only in the pycnidiospores which are 5-septate, and the ascospores which are markedly constricted at the middle septum. The ascostroma is described as being sessile. These features, however, do not appear to be sufficient to separate it specifically from *Capnodium salicinum*, since 5-septate pycnidiospores are not infrequent in this species, and the shape of the ascospores differs considerably in collections made from different localities. Owing to the kindness of Mr. C. French, of the Department of Agriculture, Victoria, the writer was able to examine specimens of *Capnodium callitris* determined by McAlpine, and could find no significant differences between it and *C. salicinum*. It is therefore desirable that *C. callitris* McAlp. be considered a synonym of *C. salicinum* Mont.

Capnodium salicinum has been found in collections from the following localities: Pennant Hills (near Sydney) on *Pittosporum undulatum* Ait., 5, 1932, on *Bursaria spinosa* Cav., 5, 1932, and on *Castanospermum australe* A. Cunn., 9, 1933; Springwood on *Leptospermum flavescens* Sm., 11, 1932; Burragorang Valley on *Leptospermum flavescens* Sm., 11, 1932; Glenorie on *Bursaria spinosa* Cav., 5, 1932; Narrabeen on *Casuarina glauca* Sieb., 11, 1932; Nowra on *Syncarpia laurifolia* Ten., 2, 1933; Mt. Kosciusko on *Epacris* sp., 1, 1934, coll. J. McLuckie.

Capnodium salicinum var. uniseptatum L. Fraser.

This variety has been described in a previous paper (Fraser, 1935). It differs from the type in the larger pycnidia (Text-fig. 3), the 2-celled hyaline pycnidiospores (Text-fig. 4), in the more compact nature of the ascostromata (Text-fig. 5), and in its cultural behaviour. It is a well marked and widely distributed form, and is common around Sydney on *Bursaria spinosa*, *Pittosporum undulatum*, *Leptospermum* spp., etc.

McAlpine (1896*a*) has described pycnidia and pycnidiospores similar to those of *C. salicinum* var. *uniseptatum* in connection with *C. citricolum*. Miss Fisher (1932) has recently shown that *C. citricolum* is, in part, *C. salicinum*. The imperfect fructifications described by McAlpine are produced by a number of different fungi (Fraser, 1933).

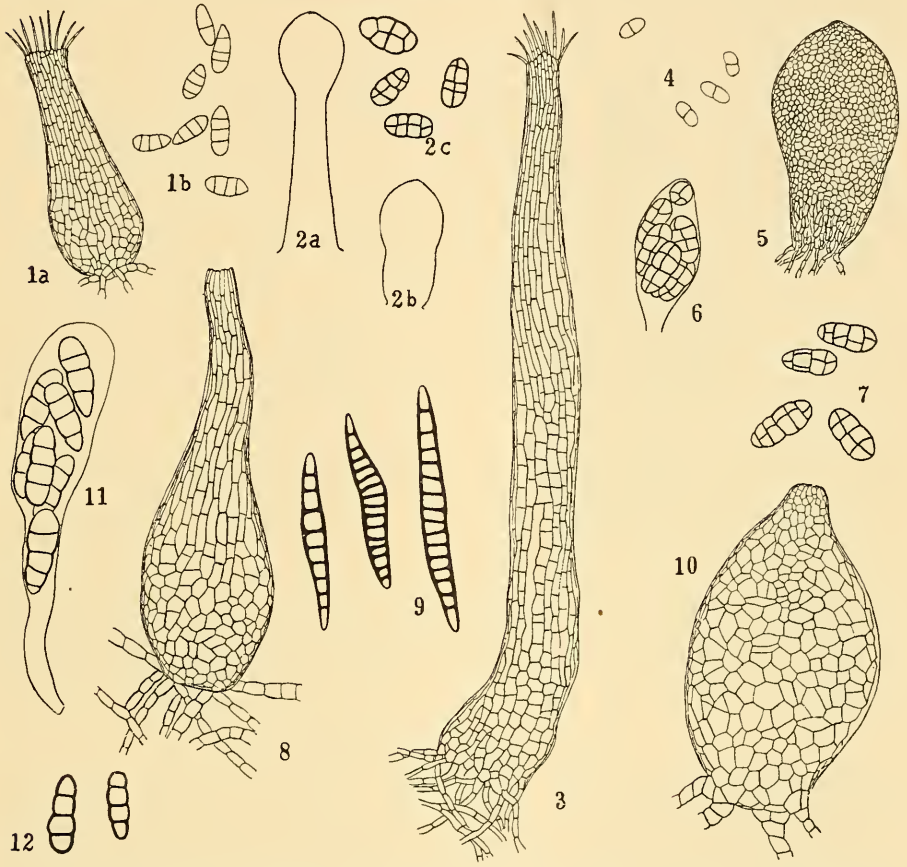
Capnodium salicinum var. *uniseptatum* has been found in collections from the following localities: Pennant Hills on *Spartium* sp., 6, 1932, Type; Macquarie Pass on *Palmeria scandens* F.v.M., 4, 1933; Huskisson on *Casuarina glauca* Sieb., 2, 1933; Narrabeen on *Leptospermum flavescens* Sm., *Synoum glandulosum* A. Juss., and *Casuarina glauca* Sieb., 1, 1934; Comboyne on *Doryphora sassafras* Endl., 1, 1934; Bateman's Bay on *Casuarina glauca* Sieb., 2, 1933; Dungog on *Eugenia Ventenatii* Benth., 5, 1934; Warialda on *Jacksonia scoparia* R.Br., 1, 1932, coll. J. Vickery; Gosford on *Melaleuca* sp., 1, 1934; Brisbane, Queensland, on *Brassaea* sp., and *Artocarpus* sp., 5, 1934, coll. A. Burges.

Capnodium Walteri Sacc. Emended description.

Hedwigia, 1893, p. 58.

Mycelium dark clear brown, usually rather thick and felt-like and black in mass. Hyphae often beaded, the cells constricted at the septa, 5·5–10μ long by 5–9μ wide, rounded, smooth.

Pycnidia usually rather numerous, with swollen basal portion and elongated neck, 110–230μ, exceptionally 500μ, long by 50–60μ, exceptionally 100μ, wide at the base, tapering to 10–20μ wide at the apex (Text-fig. 8). The pycnidiospores are elongate-fusiform, often curved, tapering towards each end, brown, thick-walled, 20–42 × 7–9μ, with 7–18 transverse septa (Text-fig. 9).



1-2.—*Capnodium salicinum*. 1*a*, Pycnidium and mycelium. × 150. 1*b*, Pycnidiospores. × 425. 2*a*, 2*b*, Ascostromata, showing long stalks. × 80. 2*c*, Ascospores. × 425.

3-7.—*Capnodium salicinum* var. *uniseptatum*. 3, Pycnidium and mycelium. × 150. 4, Pycnidiospores. × 425. 5, Ascostroma. × 150. 6, A single ascus. × 425. 7, Ascospores showing septation. × 425.

8-12.—*Capnodium Walteri*. 8, Pycnidium and mycelium. × 285. 9, Pycnidiospores. × 425. 10, Ascostroma. × 285. 11, A single ascus. × 425. 12, Ascospores showing septation. × 425.

The ascostromata are 70–100μ wide by 100–130μ long, sometimes shortly stalked (Text-fig. 10), globular or slightly elongated, the apex rounded or slightly papillate. The wall cells are isodiametrical, smaller towards the apex, clear brown. An apical pore develops at maturity. The asci are clavate, 50–60 × 10–15μ, 8-spored. The spores are arranged irregularly in the ascus (Text-fig. 11).

The ascospores are brown, thick-walled, 22–26 × 7–9μ, with three, or rarely four, transverse septa, slightly constricted at the septa, especially the median one, slipper-shaped, the upper half rather wider and more rounded than the lower half (Text-fig. 12).

The pycnidia have been figured by Miss Fisher (1932) under the name *Hendersoniella*. The ascostromata described by her as *Limacinia crassa* also belong to this fungus.

Saccardo's description of *C. Walteri* (1893) shows several errors: (1) The pycnidiospores are described as conidia and figured attached to the mycelium in an upright position. These spores are quite characteristic and unlike any others produced by sooty mould fungi. It is probable that the spore figured by Saccardo was germinating. (2) The pycnidia described by Saccardo belong to a different fungus, probably that described by Miss Fisher as *Microzyphium Leptospermi*. These pycnidia have been frequently found associated with *Capnodium Walteri* in New South Wales. (3) The ascostromata are not of typical shape, being figured with elongated necks. Miss Fisher considers that these represent the pycnidia of *Capnodium salicinum*, but this cannot be, since asci and ascospores are figured and described by Saccardo. Moreover, these ascospores are distinctly larger than the typical pycnidiospores of *C. salicinum*. It is probable that the specimens seen by Saccardo were rather aberrant in shape. Specimens somewhat resembling those figured by him, in which the apex is distinctly papillate, have been observed by the writer.

Capnodium Walteri has been found in collections from the following localities: Wyong on *Callistemon salignus* D.C., 5, 1934; Huskisson on *Bursaria spinosa* Cav., 2, 1933; Narrabeen on *Casuarina glauca* Sieb., 11, 1933; Gosford on *Melaleuca* sp., and *Leptospermum flavescens* Sm., 1, 1934; Springwood on *Leptospermum flavescens*, Sm., 8, 1932; National Park on *Ratonia* sp., 10, 1932; Nowra on *Epacris* sp., 2, 1933; Bulli on *Alphitonia excelsa* Reiss., 4, 1933; Barrington Tops on *Callistemon pallidus* D.C., 5, 1933; Picton on *Bursaria spinosa* Cav., 1, 1933; Comboyne on *Doryphora sassafras* Endl., 1, 1934. It is common around Sydney on *Bursaria spinosa*, *Leptospermum* spp., *Pittosporum undulatum*, *Eugenia Smithii*, etc.

Capnodium fuliginodes Rehm.

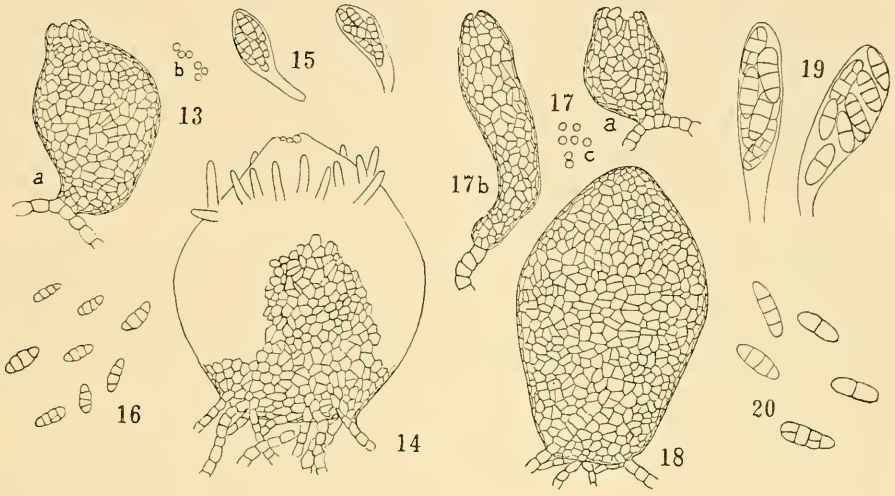
The mycelium is dark brown and felt-like, the cells cylindrical or slightly constricted at the septa, 4–5 × 4–7μ.

The pycnidia are globose or pear-shaped, 50–70 × 35–50μ, slightly papillate at the apex (Text-fig. 13*a*). The wall of the pycnidium is pseudoparenchymatous and consists of light brown isodiametrical cells. This type of pycnidium is usually referred to as *Antennularia*. The pycnidia referred to as *Chaetophoma* by Miss Fisher (1932) are similar to these and probably belong to the same fungus. The pycnidiospores are hyaline, globose, 1-celled, 1–1·2μ diameter (Text-fig. 13*b*).

The ascostromata are very dark brown, globose or slightly elongated, sessile or very shortly stalked, 70–100μ in diameter by 80–150μ in length, typically 80 × 100μ (Text-fig. 14). A number of dark, 1- or 2-celled spines are frequently present on the upper part of the fructification. These are 10–40μ long and 1·5μ in diameter at the base, slightly attenuated towards the apex which is rounded. They are, however, not always present even on all the fructifications of a single collection. The apex of the stroma is rounded, and a pore develops at the

summit at maturity. The wall is pseudoparenchymatous, consisting of brown isodiametrical cells which become smaller towards the apex.

The asci are clavate or slightly swollen at the apex, numerous, shortly stalked, 30–35 × 10μ, 8-spored. The ascospores are brown, irregularly grouped in the ascus, fairly thin walled, 3-septate with an occasional longitudinal septum, fusiform, tapering slightly towards each end, scarcely constricted at the septa, 10–12 × 3·5–5μ.



13-16.—*Capnodium fuliginodes*. 13*a*, Pycnidium and mycelium. × 425. 13*b*, Pycnidiospores. × 425. 14, Ascostroma showing setae. × 425. 15, Asci. × 425. 16, Ascospores showing septation. × 425.

17-20.—*Capnodium fuliginodes* var. *grandisporum*. 17*a*, 17*b*, Pycnidia showing different forms. × 285. 17*c*, Pycnidiospores. × 425. 18, Ascostroma. × 285. 19, Asci. × 425. 20, Ascospores showing septation. × 425.

This fungus has been referred to the species *Capnodium fuliginodes* by Miss Fisher, and her determination is followed here. Arnaud considered that *C. fuliginodes* was synonymous with *C. mori*.

The ascostromata are frequently shortly stalked; the species therefore should be placed in the genus *Capnodium*, not in the genus *Limacinia* (Arnaud, 1911). In a previous paper this fungus was referred to provisionally as *Antennularia scoriadea*. In a later paper on the cultural behaviour of the sooty moulds (1934) it was referred to as *Capnodium* sp.

Capnodium fuliginodes has been found in collections from the following localities: Comboyne on *Denhamia pittosporoides* F.v.M., 1, 1934; Yerranderie district on *Leptospermum flavescens* Sm., 10, 1933; Athol (Sydney District) on *Leptospermum flavescens* Sm., 5, 1932; Narrabeen on *Leptospermum flavescens* Sm., 11, 1933; Picton on *Bursaria spinosa* Cav., 1, 1933; Robertson on *Doryphora sassafras* Endl., 2, 1933; Pennant Hills (Sydney district) on *Bursaria spinosa* Cav., and *Pittosporum undulatum* Ait., 5, 1933; Tambourine Mountain, Queensland, on *Baccharis halimifolia* L., 5, 1934, coll. A. Burges; Brisbane, Queensland, on *Artocarpus* sp., 5, 1934, coll. A. Burges.

Capnodium fuliginodes var. grandisporum, n. var.

Mycelio epiphyllo. Cellulis subcylindricis, ad septa vix constrictis, 4–5 × 4–7μ. Pycnidiis globosis vel ovoideis, ad apicem papillatis, fuscis, 35–50 × 50–100μ. Pycnidiosporis hyalinis, continuis, globosis, 1·7–2μ crassis. Ascostromis globosis vel ovoideis, ad apicem rotundatis, atrofuscis. Ascis clavatis vel ad apicem inflatis, octosporis. Ascosporis aggregatis, fuscis, ellipsoideis, medio inflatis, 3-septatis, vix constrictis, raro 1–2-septatis, raro 1–2-longitudinaliter septatis.

The mycelium and pycnidia closely resemble those of *C. fuliginodes*. The pycnidia are somewhat more variable in shape, 35 × 50μ–50 × 100μ. The commonest types are spherical or pear-shaped, but elongated forms may also occur (Text-figs. 17*a*, 17*b*). The pycnidiospores are slightly but consistently larger than those of *C. fuliginodes*. They are hyaline, 1-celled, globose, 1·7–2μ in diameter (Text-fig. 17*c*).

The ascostromata are ovoid, dark brown, rounded at the apex, glabrous; the wall is pseudoparenchymatous, consisting of isodiametrical cells becoming smaller towards the apex where a pore develops at maturity, 75–100 × 100–140μ, sessile or very shortly stalked (Text-fig. 18).

The asci are clavate, rather narrow, 8-spored (Text-fig. 19). The ascospores are similar in shape and colour to those of *C. fuliginodes*, but are distinctly larger. They are brown, rather thin walled, fusoid, 13–19 × 4·5–5·5μ, usually 15 × 5μ. They are typically transversely 3-septate, rarely with one or more longitudinal walls, but may be occasionally only 1-septate, not constricted at the septa (Text-fig. 20).

This form retains its differences from *C. fuliginodes* in culture, and appears to be quite constant. It does not appear to be so common as *C. fuliginodes*.

Capnodium fuliginodes var. *grandisporum* has been found in collections from the following localities: Pennant Hills (Sydney district) on *Eucalyptus eugenioides* Sieb., [Type], and *Pittosporum undulatum* Ait., 8, 1933; Glenorie on *Angophora lanceolata* Cav., 5, 1932; Glenbrook on *Leptospermum flavescens* Sm., 1, 1933; Wiseman's Ferry on *Leptospermum lanigerum* Sm., 11, 1934.

Capnodium anonae Pat.

Bull. Soc. Myc. Fr., xx, 1904, pp. 134–138.

The mycelium is dark brown, often rather thick and felt-like. The cells are cylindrical, clear brown, smooth, slightly constricted at the septa, 4–5μ wide by 6–10μ long.

The pycnidia are identical with those described by Miss Fisher (1932) under the name *Microzyphium Leptospermi*. They are very variable in size, ranging from 100μ to 1,000μ in length, by 20μ to 45μ in diameter (Text-fig. 25). The spores are hyaline, continuous, elliptical, 4·5–5 × 1·5–2μ.

The ascostromata are very rarely developed. They are ovoid, rounded at the apex where a pore develops at maturity, shortly stalked, 100–150 × 150–250μ, the stalk being 50–150μ long (Text-fig. 26). The wall is composed of isodiametrical cells becoming smaller towards the apex, olive-green in colour. The asci are clavate and average 60 × 20μ. They are 8-spored.

The ascospores are arranged irregularly in the ascus. They are olive-brown at maturity, with 5 or 6 transverse septa and one or more longitudinal septa, slightly constricted at the median septum, slightly narrower and more pointed in the lower part, usually 25 × 10μ, but varying from 23–35 × 7–12μ (Text-fig. 27).

Capnodium anonae has been found in collections from the following localities: Huskisson on *Hakea pugioniformis* Cav., and *Leptospermum flavescens* Sm., 2,

1933; Bateman's Bay on *Casuarina glauca* Sieb., 2, 1933; Picton on *Leptospermum flavescens* Sm., and *Bursaria spinosa* Cav., 1, 1933; Moss Vale on *Doryphora sassafras* Endl., 10, 1932, coll. T. G. B. Osborn; Comboyne on *Doryphora sassafras* Endl., 1, 1934; Bemboka on *Bursaria spinosa* Cav., 2, 1933; Bega on *Bursaria spinosa* Cav., 2, 1933; Port Macquarie on *Leptospermum flavescens* Sm., 1, 1934; Salisbury on *Eugenia Smithii* Poir., 8, 1933; Robertson on *Doryphora sassafras* Endl., 3, 1933; Wyong on *Callistemon salignus* D.C., 5, 1934; Narrabeen on *Synoum glandulosum* A. Juss., *Leptospermum flavescens* Sm., and *Casuarina glauca* Sieb., 10, 1933; Springwood on *Leptospermum flavescens* Sm., 8, 1932; Gosford on *Melaleuca* sp., 1, 1934; Dungog on *Eugenia Ventenatii* Benth., 5, 1934; Tambourine Mountain, Queensland, on *Psychotria loniceroides* Sieb., 5, 1934, coll. A. Burges; Tweed River district on *Croton Verreauxii* Bail., 5, 1934, coll. A. Burges; Brisbane, Queensland, on *Aegiceras majus* Gaertn., 5, 1934, coll. A. Burges; Wiseman's Ferry on *Cassinia aculeata* R.Br., 11, 1934. It is common in New South Wales, frequently growing in association with *Capnodium Walteri*.

Capnodium anonae var. obscurum, n. var.

Mycelio epiphyllo. Cellulis subfuscis, ad septa constrictis, vel cylindricis. Pycnidiis elongatis, rectis, 100–150μ longis, 35–40μ crassis, olivaceo-fuscis. Pycnidiosporis hyalinis, continuis, ovoideis, $5 \times 1{\cdot}5$–2μ. Ascostromis globosis vel ellipsoideis, breviter stipitatis, ad apicem obtusis, glabris, olivaceo-fuscis, 85–105×150–200μ. Ascis clavatis, ad basem attenuatis, 50–60×18–25μ, octosporis. Ascosporis primo hyalinis dein virido-fuscis, 5–6-septatis, medio constrictis, 1–4-longitudinaliter septatis, ellipsoideis, 20–26×8–10μ, saepe $23 \times 9\mu$.

The mycelium is dark brown, cottony, often thick and felt-like. The cells are brown, smooth, slightly constricted at the septa, 4–5·5μ wide by 5·5–10μ long, very similar to the preceding species.

The pycnidia closely resemble those of *Capnodium anonae*, from which they can sometimes only be distinguished by cultural methods. They are usually rather shorter and stouter than the typical *C. anonae*, and the wall is composed of more isodiametrical cells. They are olive-brown or greenish, usually 100–150×35–40μ, the apex is rather wide, surrounded by slightly incurved hyphae which are free from one another for a short distance (Text-figs. 21*a*, 21*b*). Larger branching forms may attain a length of 400μ, but never approach the size of the larger specimens of *C. anonae* (Text-fig. 22). Under certain conditions abnormally stout pycnidia may be developed (Text-fig. 21*c*); in other cases forms closely resembling certain types of pycnidia produced by *Capnodium fuliginodes* may occur. The pycnidiospores are hyaline, continuous, ovoid, $5 \times 1{\cdot}5$–2μ.

The ascostromata resemble those of *Capnodium anonae* very closely in colour and shape, but are usually slightly smaller. They are globose or elliptical, glabrous, 85–105×150–200μ, and shortly stalked (Text-fig. 23). The apex is rounded. The wall consists of isodiametrical cells which appear bright greenish-brown by transmitted light. The asci are clavate, 50–60×18–25μ, 4-, 6- or 8-spored. The ascospores are hyaline at first, becoming olive-green. They have 5, or occasionally 6, transverse septa and are often strongly constricted at the median septum, frequently tapering towards the base, 20–26×8–10μ, usually $23 \times 9\mu$ (Text-fig. 24).

This variety shows constant cultural differences from *C. anonae*. In a previous paper on the cultural behaviour of Sooty Mould fungi it is referred to as *Microzyphium* sp.

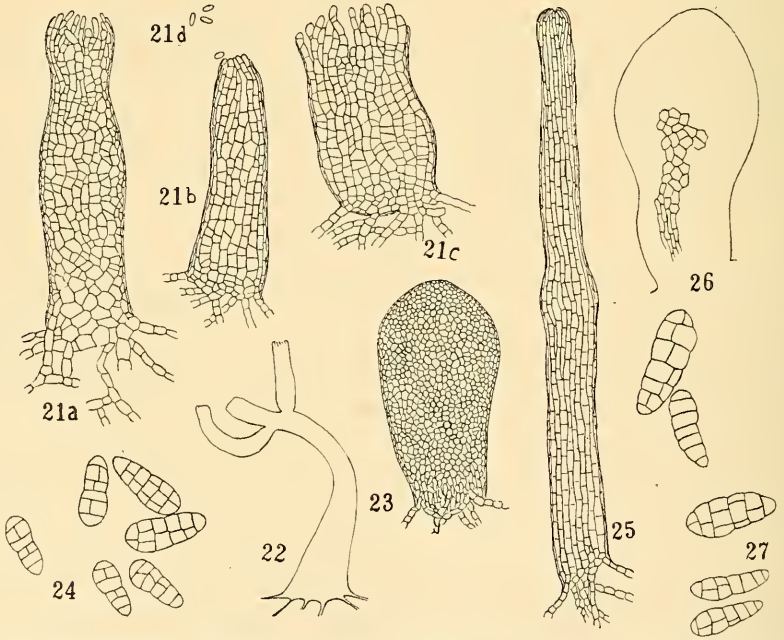
Capnodium anonae var. *obscurum* has been found in collections from the following localities: Narrabeen on *Synoum glandulosum* A. Juss., 1, 1933; Pennant Hills (Sydney district) on *Pittosporum undulatum* Ait., 5, 1933, and *Citrus* sp., 6, 1933; Macquarie Pass on *Palmeria scandens*, F.v.M., 2, 1933 (Type); Tweed River district on *Croton Verreauxii* Bail., 5, 1934, coll. A. Burges; Comboyne on *Doryphora sassafras* Endl., 1, 1934; Redlands Bay, Queensland, on *Artocarpus* sp., 5, 1934, coll. A. Burges; Tambourine Mountain, Queensland, on *Psychotria loniceroides* Sieb., 5, 1934, coll. A. Burges; Grafton district on *Eugenia australis* Wendl., 1, 1935.

Capnodium mucronatum Mont.

Ann. Sci. Nat., sér. iv, xiv, 1860, pp. 167–185.

This species forms a very thick sooty covering on the twigs and leaves of plants. It usually develops a flat weft of mycelium from which erect fascicles of hyphae grow up. The fascicles are 2–15 mm. in length and consist of twelve or more parallel hyphae held together by anastomoses. Branches may be given off at the bases of these bundles of hyphae which connect neighbouring fascicles.

The young growing hyphae are olive-green, later becoming brown, with thick longitudinally striate walls when mature. The cells are cylindrical, scarcely constricted at the septa, 30–50μ long by 10–15μ wide. This mycelium is therefore very distinctive and can be recognized without difficulty. The shorter cells, e.g., of germ tubes or of the lateral branches of fascicles, may be almost beaded,

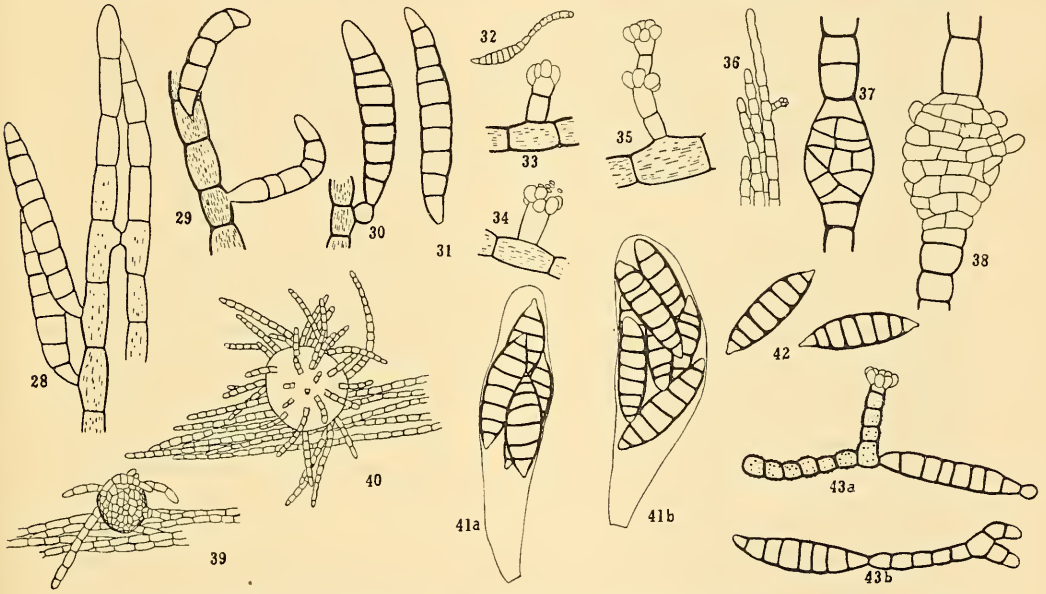


21-24.—*Capnodium anonae*, var. 21*a*, A typical pycnidium. × 285. 21*b*, 21*c*, Other types of pycnidia. × 285. 21*d*, Pycnidiospores. × 425. 22, Pycnidium showing branching. × 80. 23, Ascostroma. × 150. 24, Ascospores showing septation. × 425.

25-27.—*Capnodium anonae* Pat. 25, Pycnidium. × 285. 26, Ascostroma. × 285. 27, Ascospores showing septation. × 425.

15μ long by 10μ in diameter, and the striations are short, giving a rugose appearance.

Conidia of two kinds are produced by this fungus: (1) Large transversely septate conidia are produced laterally by the outer cells of the upright fascicles (Text-figs. 28, 29, 30). These grow upwards parallel to the hyphae on which they are produced, and may be so numerous as to give the fascicles a furry appearance. When mature they are 7–9-septate, curved or straight, 100–110 × 20–25μ (Text-fig. 31). The walls are clear olive-green, smooth or faintly longitudinally striate, thinner at the point of attachment than elsewhere. They are very easily dislodged when mature, and germinate directly (Text-fig. 32). (2) The basal outer hyphae of a fascicle or the free branches or occasionally the cells near the tips of old fascicles may produce short lateral branches of two or three cells which give rise to the second type of conidia. These lateral branches produce at the apex a ring of smaller thin-walled pale cells as shown in Text-figures 33 and 36, thus forming a shallow cup at the apex. Small hyaline thin-walled conidia, 3 × 1μ, are then produced, apparently being budded off from the inner walls of the ring of hyaline cells (Text-fig. 34). These conidia were not observed to germinate. Occasionally the axis of one of these lateral branches may grow through the ring of cells and form a second ring above the first (Text-fig. 35).



28-43.—*Capnodium mucronatum.* 28, Part of the apex of a fascicle of hyphae showing anastomoses and attachment of conidia. × 285. 29, 30, Hyphae showing the attachment of conidia. × 285. 31, A mature conidium. × 285. 32, A germinating conidium. × 285. 33, A young lateral branch showing group of pale cells at the apex. × 285. 34, Lateral branch showing conidia of the second type. × 285. 35, A lateral branch showing further growth. × 285. 36, Part of the apex of a fascicle of hyphae showing the position of a lateral branch which produces conidia of the second type. × 100. 37-38, Stages in the development of the ascostroma. × 285. 39, A young ascostroma showing the development of setae. × 100. 40, A later stage in the development of the ascostroma. × 55. 41*a*, 41*b*, Four- and eight-spored asci. × 285. 42, Mature ascospores. × 285. 43*a*, 43*b*, Germinating ascospores. × 285.

Ascogenous fructifications are produced laterally on the young fascicles by the division of several adjoining cells of a single hypha (Text-fig. 37). Hypha-like appendages appear at an early stage (Text-fig. 38), becoming very numerous as the fructification approaches maturity (Text-figs. 39, 40). The mature fructification is 350–400μ in diameter and clearly visible macroscopically because of the numerous appendages. The cells of the wall are isodiametrical, brown, averaging 20μ in diameter. As far as could be seen no pore is developed, and the walls disintegrate at maturity, liberating the spores. The asci are clavate, 110–130 × 30–40μ, 4- or 8-spored (Text-figs. 41*a*, 41*b*). The spores are fusiform, greenish-brown, the end cells being thinner and paler at the apices, which at maturity are slightly papillate (Text-fig. 42). They are transversely 7-septate, 50–60 × 15–18μ. They germinate immediately after liberation, giving rise to a brown, rather rugose germ tube (Text-figs, 43*a*, 43*b*). Cases have been seen where conidia have been produced by short lateral branches on these germ tubes (Text-fig. 43*a*.)

This species has only previously been recorded by Montagne from Chili. Montagne described the characteristic fascicles of hyphae, the setose fructifications and the distinctive ascospores, but did not observe the conidia. It shows some resemblances to *Antennaria scoriadea* Berk. (J. D. Hooker, The Botany of the Antarctic Voyage, 1839-43, London, 1844, 1, p. 175), but differs in the ascigerous fructifications (von Hoehnel, 1909).

Capnodium mucronatum has been found in collections from the following localities: Salisbury on *Eugenia Smithii* Poir., and *Weinmannia rubifolia* Benth., 8, 1933, on *Eupomatia laurina* R.Br., 1, 1934, on *Cryptocarya microneura* Meiss., 8, 1934; Barrington Tops on *Callistemon pallidus* D.C., 1, 1934, 4, 1934; Comboyne on *Cryptocarya Meissneri*, F.v.M., 1, 1935; Mount Cook district, New Zealand, on *Podocarpus Hallii* T. Kirk., 1, 1933, coll. A. Burges.

Capnodium moniliforme, n. sp.

Mycelio epiphyllo. Cellulis moniliformibus, inflatis, saepe latioribus quam longibus, levibus, ad septa constrictis, 10–15 × 10–20μ. Conidiis in brevibus ramulis ex 3–5 cellulis parvis, conidiis tantum uno lato ramuli latis, primo hyalinis, continuis, dein 1-septatis, fuscis, facile disiunctis. Conidiis maturis 10–20 × 7–10μ, deorsum acutioribus, fuscis striatis. Pycnidiis globosis vel ovoideis, 20–30 × 40–50μ, apici papillatis. Pycnidiosporis hyalinis, continuis, ovoideis, 5 × 2·5–3μ. Ascostromis oblongo-ovoideis, subfuscis, 150 × 90–115μ. Interdum circa apicem setulis divergentibus, 2–6-cellulis, 20–40μ longis, 8μ crassis ad basem. Ascis paucis, clavatis, 65 × 15μ, octosporis. Ascosporis olivaceo-fuscis, 3-septatis, saepe curvatis, 3–4-stichis, vel conglobatis, ad septa vix constrictis, cellulis mediis inflatis, 18–31·5 × 9–11μ, saepe 21 × 9μ.

The mycelium forms a rather thick covering on the leaves and branches of plants. The hyphae are markedly beaded, the individual cells being much inflated and constricted at the septa, 10–20μ long by 10–15μ in diameter or occasionally larger when old. They are clear brown and smooth except when very old, when they may be slightly longitudinally striate (Text-figs. 44*a*, 44*b*).

Conidia are produced on short curved or straight terminal or lateral branches of 3 to 5 smaller cells (Text-fig. 45, *a-c*). These may occur singly (Text-fig. 45*a*) or in groups to form a small branch system (Text-fig. 47, which shows the branches after the shedding of the conidia). Conidia are budded off from one face only. They remain attached for some time forming botryoidal tufts (Text-fig. 46). The conidia are at first hyaline, then becoming light brown, and

finally thick-walled and very dark (Text-fig. 48). When mature they are very readily detached, 1-septate, 10–20 × 7–10μ, the upper cell is rounded and broad, the lower cell narrower and pointed, and rather thin walled at the point of attachment.

Pycnidia are produced at a different time from the conidia, most frequently after they have fallen. They are of the *Antennularia* type, globose or pear-shaped, papillate at the apex, 30–40 × 40–50μ (Text-fig. 49*b*). Occasionally more than one ostiole may be produced by the one pycnidium (Text-fig. 49*c*). The pycnidia are compound meristogenous in origin (Text-fig. 49*a*). The pycnidiospores are ovoid, hyaline, 5 × 2·5–3μ (Text-fig. 49*d*).

Ascostromata are ovoid or slightly oblong, 95–115μ in diameter by about 150μ long, dark brown. A number of short, 2–6-celled, divergent setae may develop from the upper part of the fructification (Text-fig. 50). These are dark brown, rounded at the apex, 20–40μ long by 8μ in diameter at the base. The setae are not always present, even on all the fructifications in the one collection. The walls of the ascostromata are rather thin at maturity, composed of straw-brown isodiametrical cells which are smaller towards the apex.

The asci are clavate, not numerous, averaging 65 × 15μ, 8-spored (Text-fig. 51). The spores are transversely 3-septate, typically fusoid or slightly curved, tapering towards each end, the end cells smaller than the middle ones, slightly constricted at the septa, averaging 21 × 9μ, but varying considerably with age from 18 × 9μ to 31·5 × 11μ (Text-fig. 52).

This is a well marked species, easily distinguished by the large size of the mycelium cells and their pronounced constriction at the septa. It appears to resemble most closely *Phragmocapnias smilacina* Mendoza, but differs from it in the position of the appendages and in the size of the ascospores.

Capnodium moniliforme has been found in collections from the following localities: Robertson on *Doryphora sassafras* Endl., 2, 1933, 1, 1934; Barrington Tops on *Epacris* sp., 1, 1934; Salisbury on *Backhousia myrtifolia* Hook. and Harv., 1, 1934, 5, 1934 (Type), on *Callistemon salignus* D.C., 8, 1933, on *Weinmannia rubifolia* Benth., *Eugenia Smithii* Poir., and *Ficus stephanocarpa* Warb., 1, 1934; Moss Vale on *Doryphora sassafras* Endl., 10, 1932, coll. T. G. B. Osborn; Comboyne on *Doryphora sassafras* Endl., *Alyxia ruscifolius* R.Br., 1, 1934; Dorrigo on *Cryptocarya glaucescens* R.Br., 1, 1934; Pennant Hills (Sydney district) on *Tristania laurina* R.Br., 5, 1932; Mt. Wellington, near Hobart, Tasmania, on *Polystichum aculeatum* (L.) Schott., 1, 1933, coll. D. Martin; Mount Cook district, New Zealand, on *Podocarpus Hallii* T. Kirk, 1, 1933, coll. A. Burges.

Capnodium elegans, n. sp.

Mycelio epiphyllo, cum hyphis polymorphis, fuscis. Hyphis repentibus cellulis cylindricis, vix constrictis, atrofuscis. Hyphis erectis ex hyphis repentibus ascendentis, 500–1500μ longis, 20–40μ crassis ad basem. Hyphis erectis ramosis arbori similibus.

Pycnidiis ex hyphis erectis latis, fuscis, globosis, 25–50μ longis. Pycnidiosporis hyalinis, continuis, ovoideis, 2·5μ longis.

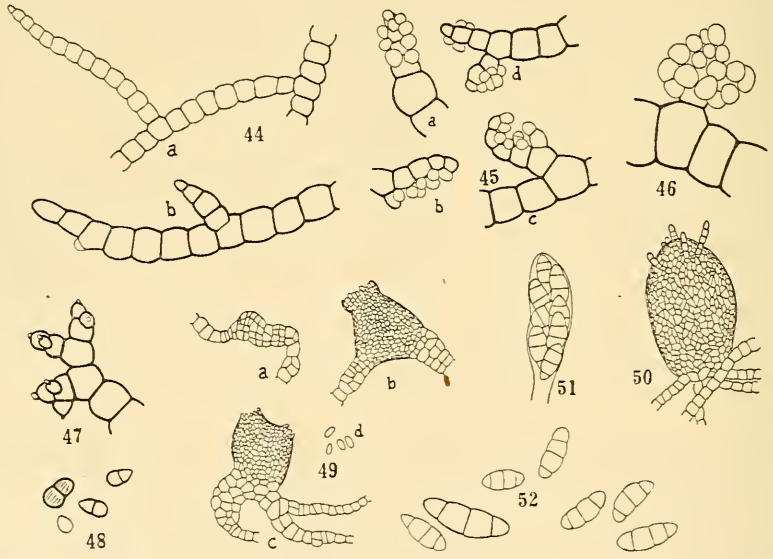
Ascostromis ex hyphis erectis latis, atrofuscis, ovoideis, 100 × 200μ, muris ex cellulis atrofuscis, pseudoparenchymaticis. Ascis paucis, crasso-clavatis, 4–6–8-sporis, 100 × 35μ. Ascosporis fuscis, 1–3-septatis, vix constrictis, oblongis, 72–90 × 15–18μ.

The mycelium forms a very thick dark brown covering on the twigs and leaves of plants. There are two types of hyphae. The stoloniferous hyphae are

much interwoven and consist of tubular cells scarcely constricted at the septa, 15μ wide by 20–30μ long, becoming very thick walled and dark in colour so that the transverse septa cannot be distinguished. These hyphae give rise at intervals to upright growing branches (Text-fig. 53). These upright hyphae branch monopodially and, when full grown, present the appearance shown in Text-figure 54. Often, however, they are not so perfectly developed and examples such as are shown in Text-figures 55*a* and 55*b* may occur. They vary in height from 500 to 1,500μ; the basal cells are 20μ wide by 30–40μ long and become very thick walled and dark and opaque. The upper cells are clear coffee-brown and become progressively smaller. The lateral branches may drop off and germinate to form a fresh mycelium (Text-fig. 56).

The pycnidia are terminal or intercalary on the upright branches. They are infrequent, small, and of the *Antennularia* type, 25–55μ diameter and almost globular, dark brown (Text-fig. 57). The pycnidiospores are hyaline, oval, 1-celled, about 3μ in length.

The ascostromata are sometimes terminal, but usually intercalary on the upright hyphae, the hypha continuing at an angle (Text-fig. 58). They are ovoid or slightly curved, sometimes narrowed towards the base into a short stalk. The walls are dark brown and consist of isodiametrical cells 10μ in diameter, becoming smaller towards the apex where a pore develops at maturity. The average size is 100μ wide by 200μ long. The asci are not numerous, broad clavate, 100 × 35μ, 4-, 6- or 8-spored (Text-fig. 59). The ascospores are brown,



44-52.—*Capnodium moniliforme*. 44*a*, Part of the mycelium. × 230. 44*b*, A growing hypha showing young branches. × 230. 45, Conidiophores of various types. × 120. 46, Older stages in the development of conidia. × 230. 47, Conidiophore branch after the conidia have fallen. × 230. 48, Mature conidia. × 230. 49*a*, Development of a pycnidium. × 120. 49*b*, A mature pycnidium. × 120. 49*c*, A pycnidium showing the presence of two ostioles. × 120. 49*d*, Pycnidiospores. × 340. 50, Ascostroma showing setae. × 120. 51, A single ascus. × 340. 52, Ascospores showing septation and variation in size. × 340.

thin-walled, usually 3-septate, but occasionally 1- or 2-septate by the non-development of a septum, rather oblong in shape, rarely constricted at the septa, 72–90 × 15–18μ (Text-fig. 60).

This is a well-marked species, easily recognized in the absence of fructifications by the unusual mycelium.

Capnodium elegans has been collected in the following localities: Taree district on *Guioa semiglauca* Radlk., 1, 1934 (Type); Salisbury on *Backhousia myrtifolia* Hook. and Harv., *Eugenia Smithii* Poir., *Eupomatia laurina* R.Br., and *Weinmannia rubifolia* Benth., 8, 1933, and 1, 1934; Barrington Tops on *Epacris* sp., 1, 1934; Grafton district on *Guioa semiglauca* Radlk., 1, 1935; Comboyne on *Cryptocarya Meissneri* F.v.M., 1935.

Limacinia concinna, n. sp.

Mycelio scoriadeo, epiphyllo, atrofusco. Cellulis fuscis, vel olivaceo-fuscis, vix constrictis, 7 × 7–10μ.

Pycnidiis globosis vel ovoideis, fuscis 20–55 × 30–70μ, ad apicem papillatis. Pycnidiosporis hyalinis, continuis, ovoideis, 4 × 1·5μ.

Ascostromis globosis, sessilibus, atrofuscis, cum 4–12 setis mycelio similibus, 80–110μ crassis. Ascis cylindricis vel clavatis, 45–50 × 10–20μ, octosporis. Ascosporis hyalinis, 3-septatis, tenuibus, deorsum attenuatis, apici rotundatis, 13–14 × 3–4μ.

The mycelium characteristically forms a rather thick floccose layer. The hyphae are much interwoven, clear straw-brown to faintly olive-brown, rather coarse (Text-fig. 61). The cells are smooth, slightly constricted at the septa, averaging 7μ wide by 7–10μ long.

The pycnidia are of the *Antennularia* type, globose to ovoid, dark brown, 20 × 30 to 55 × 70μ. The ostiole is slightly papillate. The spores are hyaline, ovoid, 4 × 1·5μ (Text-fig. 62).

The ascostromata are globular, 80–110μ in diameter, with four to nine long mycelial-like appendages, 100–150μ in length (Text-figs. 63*a*, 63*b*). The wall is dark brown, consisting of small isodiametrical cells 6–8μ in diameter, becoming smaller towards the apex where a pore develops at maturity. The asci are cylindrical to clavate or ovate, 45–50 × 10–20μ, 8-spored. The ascospores are irregularly grouped in the ascus, hyaline, with three transverse septa, rounded at the top, tapering slightly to the base, 13–14 × 3–4μ.

Limacinia concinna has been found in collections from the following localities: Gosford on *Melaleuca* sp., 1, 1934; Dorrigo on *Cryptocarya glaucescens* R.Br., 1, 1934; Glenorie on *Celastrus Cunninghamii* F.v.M., 5, 1932; Narrabeen on *Synoum glandulosum* A. Juss., 10, 1933; Pennant Hills (Sydney district) on *Pittosporum undulatum* Ait., 6, 1933, on *Ceratopetalum apetalum*, D. Don, 3, 1933 (Type); Tweed River district on *Mangifera indica* L., 5, 1934, coll. A. Burges.

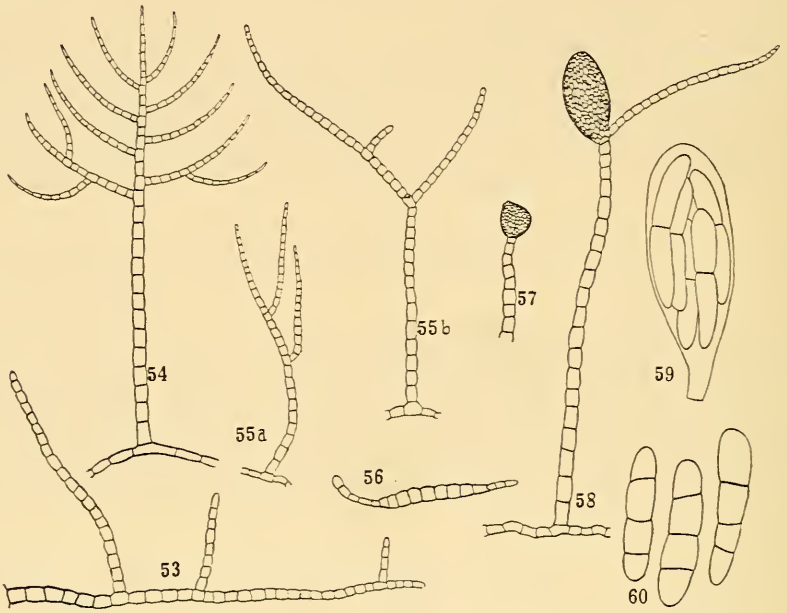
Scorias philippinensis Mendoza.

Phil. Journ. Sci., 47, pp. 289–291, 1932.

The mycelium is flat, thin effused, rather slimy; the cells are cylindrical, 7–10μ long by 4–6μ wide. The hyphae often hang together in strands, forming an almost continuous weft one cell thick.

The pycnidia are very elongated, narrow, dark olive-green, becoming opaque black in the lower stalk region, so that the individual cells cannot be distinguished, 400–900μ long by 20–35μ wide in the middle, which is usually slightly swollen (Text-fig. 66). Branched pycnidia may occur (Text-fig. 67). The apex is lined by a few stiff hyaline hairs. The pycnidiospores are hyaline, ovoid, 3·5 × 1·5μ.

The ascostromata are olive-green, ovoid to globose, shortly stalked, 100 × 100–160μ. The wall is made up of isodiametrical cells 3–4μ in diameter (Text-fig. 68).



53-60.—*Capnodium elegans*.—53, A horizontal hypha showing the growth of erect hyphae. × 65. 54, A mature upright hypha showing branching. × 65. 55*a*, 55*b*, Upright hyphae showing imperfect branching. × 65. 56, Growth of a detached lateral branch of an upright hypha. × 65. 57, Pycnidium. × 65. 58, Ascostroma on an upright hypha. × 65. 59, A young ascus. × 340. 60, Mature ascospores. × 340.

The asci are clavate, 30 × 15μ, 8-spored. The ascospores are hyaline, with three transverse septa, tapering slightly towards the lower end. They average 17 × 5μ (Text-fig. 69).

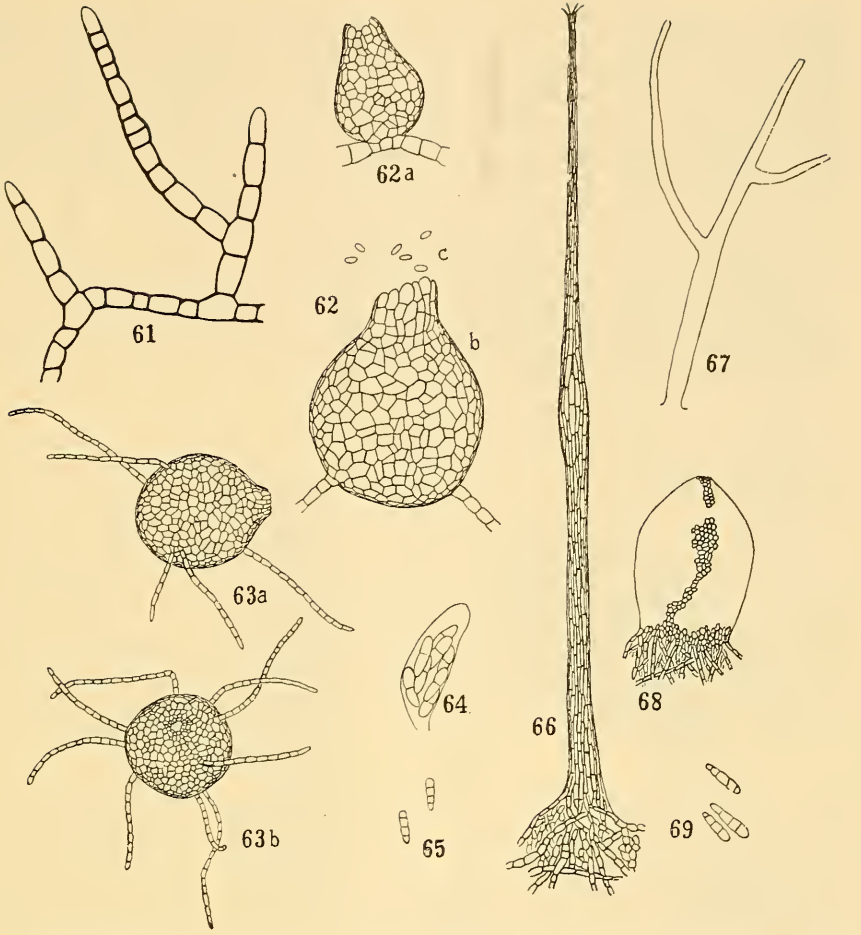
This fungus appears to agree fairly well with the type described and figured by Mendoza (1932). It differs in the smaller size of the spores and asci, which in the type are described as 21–23 × 3–4μ and 40–57 × 12–13μ respectively. The size and shape of the pycnidia and ascostromata and the shape of the ascospores however show very close resemblances.

The New South Wales type is therefore placed in this species.

Scorias philippinensis has been found in collections from the following localities: Salisbury on *Eupomatia laurina* R.Br., 1, 1934, on *Eugenia Smithii* Poir., 5, 1934; Bulga (Wingham district) on *Lyonsia straminea* R.Br., 1, 1934.

Henningsomyces affine, n. sp.

Mycelio epiphyllo, cellulis moniliformibus, inflatis, ad septa constrictis, 8–10μ latis, 9–11μ longis. Ascostromis ovoideis glabris, fuscis, 95–115μ longis, 60–75μ latis, apice papillatis. Ascis clavatis, ad apicem rotundatis, 40–50 × 15–20μ, octosporis. Ascosporis conglobatis, fuscidulis, 1-septatis, ad apicem rotundatis, basi attenuatis, 12–15 × 3·5–5μ.



61-65.—*Limacinia concinna.* 61, Part of the mycelium showing branching. × 425. 62*a*, 62*b*, Pycnidia. × 425. 62*c*, Pycnidiospores. × 425. 63*a*, 63*b*, Different aspects of the ascostroma showing mycelium-like setae and apical pore. × 150. 64, Young ascus. × 425. 65, Mature ascospores. × 285.

66-69.—*Scorias philippinensis.* 66, Pycnidium and mycelium. × 150. 67, Pycnidium showing branching. × 80. 68, Ascostroma. × 150. 69, Ascospores. × 425.

The mycelium forms a dark brownish-black, rather thin, cottony layer over the surface of leaves and twigs. The hyphae are prominently beaded (Text-fig. 70), resembling those of *Capnodium moniliforme* and scarcely to be distinguished from them. The cells are characteristically slightly smaller than those of *Capnodium moniliforme*, 8–10μ in width by 9–11μ in length, smaller when young, clear brown, smooth-walled. Branching of the hyphae takes place nearly at right angles, and at irregular intervals.

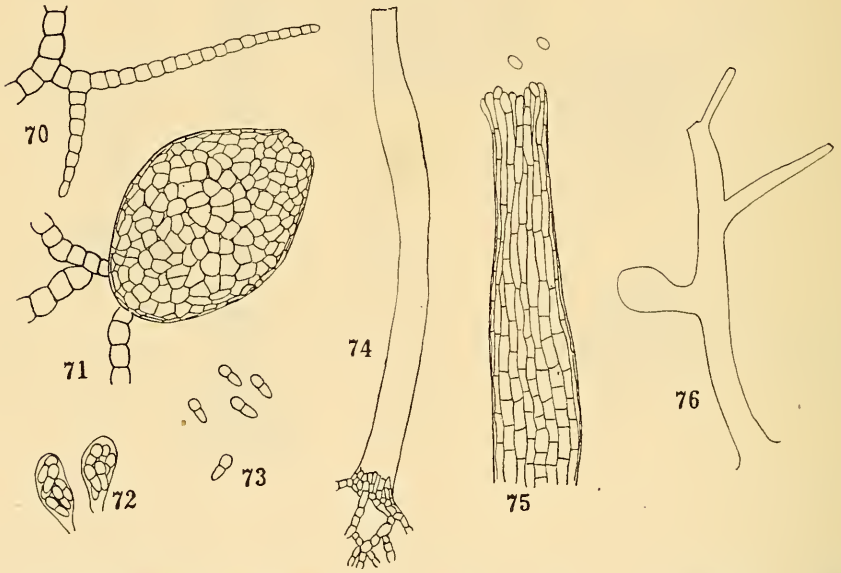
Pycnidia were not observed.

Ascostromata (Text-fig. 71) are developed meristogenously, the hyphae which give rise to them being very apparent. When mature the ascostromata are ovoid,

95–115μ in length by 60–75μ in diameter, sessile, glabrous, with a prominent, slightly raised apical pore. The pore is surrounded by cells slightly smaller than those forming the wall of the ascostroma. These wall cells are clear brown, the mature fructification appears black. Asci (Text-fig. 72) are not numerous, 40–50 × 15–20μ, clavate, rounded at the apex, 8-spored. The ascospores are irregularly arranged in the asci, and are 1-septate, light smoky-yellow in colour, 12–15 × 3·5–5μ, the upper cell is slightly shorter, wider and more rounded than the lower one, both apices are rounded (Text-fig. 73).

Henningsomyces affine has been collected in the Mitchell River district, between Glen Innes and Grafton, on *Eugenia australis* Wendl., *Rhodosphaeria rhodanthema* (F.v.M.) Engl., and *Bursaria spinosa* Cav. (Type), 1, 1935.

It differs from *H. pusillimus* Syd. in the glabrous condition of the ascostromata, and from *Parascorias spinosa* Mendoza in the colour and size of the ascospores, and in the smooth mycelium.



70-73.—*Henningsomyces affine*. 70, Mycelium. × 285. 71, Ascostroma. × 285. 72, Asci. × 285. 73, Ascospores. × 285.

74-76.—*Capnodium australe*. 74, Pycnidium and mycelium. × 150. 75, Apex of pycnidium and pycnidiospores. × 425. 76, Pycnidium showing branching and the development of an ascostroma on the stalk of the pycnidium. × 80.

Capnodium australe Mont.

Journ. Hort. Soc. London, iv, 1849, p. 253.

This species has been thoroughly described by Miss Fisher (1932) and others, but the pycnidial fructifications do not appear to have been noted. When present the pycnidia are very numerous. They are elongated, slightly swollen towards the middle (Text-fig. 74). The cells composing the walls are long and narrow in the region of the neck and stalk, rather shorter and more isodiametrical in the swollen centre part. The apex is not fringed (Text-fig. 75). The pycnidia branch very frequently, and occasionally ascostromata have been seen arising

from the stalks of old pycnidia (Text-fig. 76). The pycnidiospores are broad ovoid, hyaline, 1-celled, 5 × 3μ.

Capnodium australe has been collected only from Ulladulla on *Casuarina glauca* Sieb., 3, 1933, and 8, 1934.

The following five species are incompletely known, and so no specific names have been applied to them. Only pycnidial fructifications have been found. They are all of common occurrence and some of them are of great importance in the formation of sooty moulds.

Microzyphium sp. 1.

This fungus belongs to the form genus *Microzyphium*. It produces elongated pycnidia resembling those of *Scorias philippinensis* but much stouter, and is quite distinct from it culturally. The pycnidia are 600–1,000μ in length, 50–80μ in diameter in the middle, which is usually swollen, the stalk being 30μ in diameter and the neck 10–15μ. The cells are olive-green, becoming black and opaque in the region of the stalk, elongated except in the central region, where they are short and broad (Text-fig. 77). The ostiole is fringed by numerous hyaline, pointed, 1–2-septate, hair-like cells (Text-fig. 78). The pycnidiospores are numerous, hyaline, 1-celled, ovoid, 6 × 3μ. The mycelium resembles that of *Scorias philippinensis* but is slightly stouter and darker brown. In a previous paper (Fraser, 1934) this species was referred to as *Microzyphium* sp. B.

This species has been found in collections from the following localities: Pennant Hills (Sydney district) on *Citrus* sp., and *Pittosporum undulatum* Ait., 6, 1933; Pittwater on *Bursaria spinosa* Cav., and *Eugenia Smithii* Poir., 5, 1932; Tilba Tilba on *Ficus stephanocarpa* Warb., 2, 1933; Comboyne on *Doryphora sassafras* Endl., 1, 1934; Brisbane, Queensland, on *Brassaea* sp., and *Artocarpus* sp., 5, 1934, coll. A. Burges; Tweed River district on *Croton Verreauxii* Bail., 5, 1934, coll. A. Burges.

Microzyphium sp. 2.

The mycelium is dark brown and forms a rather thick mat of hyphae. The cells are cylindrical or slightly beaded, 5 × 5μ to 7 × 10μ in size, smooth, light brown. The pycnidia may be scattered but are more usually very closely massed together, forming compact cushion-like patches on leaves and twigs. The pycnidia are very elongate and commence as upgrowths of loosely interwoven hyphae invested in a mucilaginous covering (Text-fig. 79). The apex then grows up as a narrow neck composed of long narrow dark-brown closely-associated cells (Text-figs. 80–81). At maturity the ostiole is fringed by 6–10 hyaline hair-like cells 15–20μ long (Text-figs. 82–83). The pycnidiospores are produced within the lower inflated part. This inflated part may be very long and branched (Text-fig. 84), or may be almost absent. The pycnidia vary from 500μ to 1,500μ in length, a frequent size being 500μ by 55μ in diameter at the base and 10μ at the apex.

The pycnidiospores are hyaline, 1-celled, ovoid, 4·5 × 2μ.

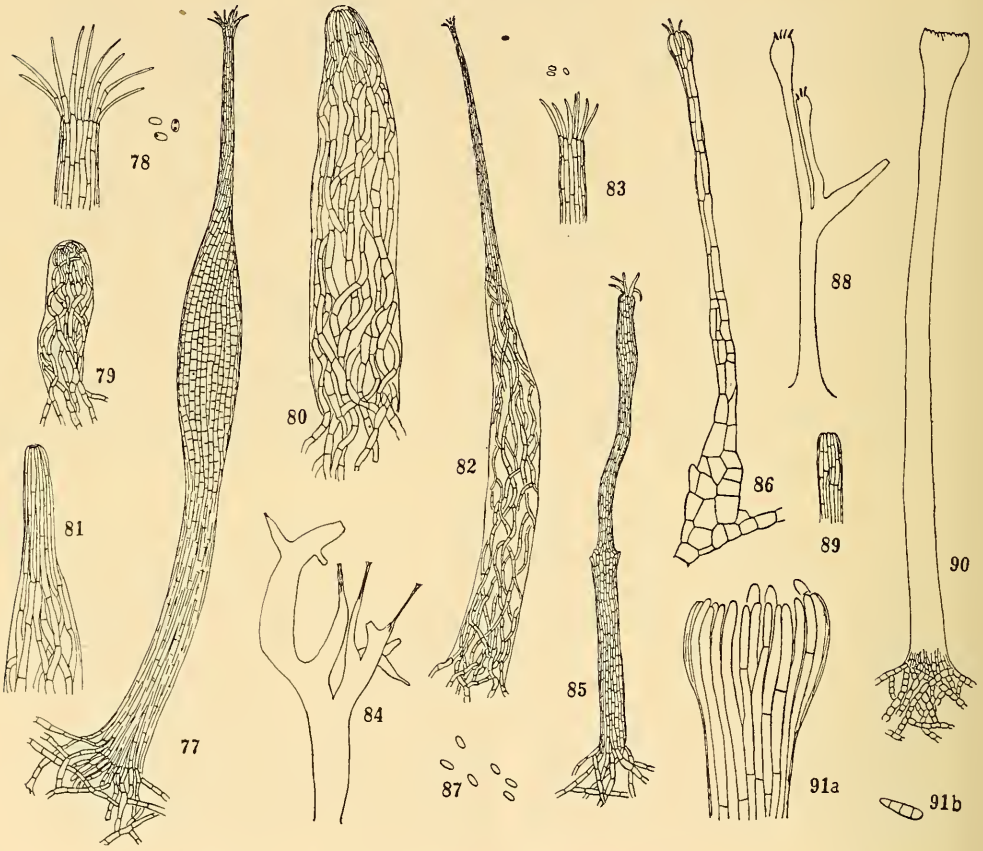
This is one of the commonest of the species in rain forest areas. *Capnodium* (?) *casuarini* McAlp. (McAlpine, 1902–3) appears to be identical with this form. In a previous paper (Fraser, 1934) this fungus was referred to as *Microzyphium* sp. C.

Microzyphium sp. 2 has been found in collections from the following localities: National Park (Sydney district) on *Rhodamnia trinervia* Blume, 5, 1932; Comboyne on *Doryphora sassafras* Endl., *Alyxia ruscifolius* R. Br., etc., 1, 1934;

Macquarie Pass on *Palmeria scandens* F.v.M., 2, 1933; Robertson on *Doryphora sassafras* Endl., 3, 1933; Dorrigo on *Cryptocarya glaucescens* R. Br., 1, 1934; Moss Vale on *Doryphora sassafras* Endl., 10, 1932, coll. T. G. B. Osborn.

Microzyphium sp. 3.

This species is always found growing in association with other species, and produces relatively few pycnidia. The cells are slightly constricted at the septa, the mycelium is interwoven, slender, light brown. The pycnidia have been figured by Miss Fisher (1932) and are unmistakable. They are flask-shaped with



77-78.—*Microzyphium* sp. 1. 77, Pycnidium and mycelium. × 120. 78, Apex of pycnidium and pycnidiospores. × 340.

79-84.—*Microzyphium* sp. 2. 79-81, Development of the young pycnidium. × 230. 82, Mature pycnidium. × 120. 83, Apex of the pycnidium and pycnidiospores. × 340. 84, Pycnidium showing branching. × 65.

85-89.—*Caldariomyces* sp. 1. 85, Pycnidium and mycelium. × 120. 86, A small type of pycnidium. × 340. 87, Pycnidiospores. × 340. 88, Pycnidium showing branching. × 120. 89, Apex of immature pycnidium showing similarity to *Microzyphium leptospermi*. × 340.

90-91.—*Caldariomyces* sp. 2. 90, Pycnidium. × 120. 91*a*, Apex of pycnidium. × 340. 91*b*, Pycnidiospore. × 340.

a globular basal part 50–80μ in diameter, the walls of which are composed of isodiametrical cells of a clear ferruginous colour. The neck is elongated and narrow, averaging about 30μ in diameter. The whole fructification varies from 200μ to 400μ in length. The pycnidiospores, which are produced in the enlarged basal part, are globose or slightly ovoid, 1- or 2-celled, 9 × 7·5μ.

This species has been found in collections from the following localities: Pennant Hills (Sydney district) on *Pittosporum undulatum* Ait., 10, 1933; Macquarie Pass on *Palmeria scandens* F.v.M., 2, 1933; Comboyne on *Doryphora sassafras* Endl., 1, 1934; Tweed River district on *Croton Verreauxii* Bail., 5, 1934, coll. A. Burges.

Caldariomyces sp. 1.

The mycelium is sooty-brown, loosely interwoven, fairly thick and floccose. The cells are cylindrical, scarcely constricted, 5–6μ in diameter by 7–15μ in length. The pycnidia vary considerably in size and form (Text-figs. 85–86). The stalk may be a slender structure only two cells in diameter (Text-fig. 86), or may be much stouter, slightly resembling the pycnidium of *Capnodium anonae* (Text-figures 85–89). The spores are produced at the apex of the stalk in a short cavity, fringed by 5–8 hyaline hair-like cells. Further growth may take place, the stalk continuing to grow through the pycnidial cavity forming another fructification at a higher level (Text-fig. 85). When the fungus is grown in culture the definite cup-like structure is not produced and the spores are borne on the inner surfaces of short, slightly divergent branches at the head of the stalk, very similar to those described by Zopf (1878; see also Woronichin, 1926). This species differs from *Caldariomyces fumago* Woronichin in its very much smaller size. The pycnidia are 200–500 × 8–25μ. They are often simple but may branch repeatedly (Text-fig. 88). The pycnidiospores are hyaline, ovoid, oblong, 6 × 1·5μ (Text-fig. 87).

Caldariomyces sp. 1 has been found in collections from the following localities: Pennant Hills (Sydney district) on *Ceratopetalum apetalum* D. Don, 5, 1932, 3, 1933, on *Callicoma serratifolia* Andr., 5, 1932; National Park (Sydney district) on *Rhodamnia trinervia* Blume, 5, 1932.

Caldariomyces sp. 2.

The mycelium is very dark brown. The cells are cylindrical or beaded, 5μ in diameter by 5–10μ in length. The pycnidia are scattered or in groups, usually simple but occasionally branched near the base. The stalks are very long and opaque-black, 600–1,000μ by 35μ at the base, tapering gradually to 25μ at the apex (Text-fig. 90). At the apex the stalk expands into a small cup-like structure widest at the top (Text-fig. 91*a*). The spores are borne in this open cup. The spores are hyaline or yellowish, fusiform, tapering to the lower end, 1–3-septate, 18 × 5μ (Text-fig. 91*b*).

Caldariomyces sp. 2 has been found in collections from the following localities: Comboyne on *Alyxia ruscifolius* R. Br., 1, 1934; Robertson on *Doryphora sassafras* Endl., 3, 1934; Barrington Tops on *Epacris* sp., 5, 1934; Salisbury on *Callistemon salignus* D.C., 8, 1933; Moss Vale on *Doryphora sassafras* Endl., 10, 1932, coll. T. G. B. Osborn; Tweed River district on *Croton Verreauxii* Bail., 5, 1934, coll. A. Burges.

Summary.

Six new species and varieties of sooty mould fungi are described and their relationships discussed.

Emended descriptions are given of a number of incompletely known species: *Capnodium Walteri* Sacc., *C. fuliginodes* Rehm., *C. anonae* Pat., and *C. mucronatum* Mont.

Scorias philippinensis Mendoza is recorded for the first time in Australia.

The pycnidial stage of *Capnodium australe* is described.

Five common types of pycnidial fructification are recorded.

The writer wishes to express her thanks to Professor T. G. B. Osborn, in whose laboratory this work was carried out, for advice and helpful criticism, and to the members of the staff and the research students, past and present, of the Botany School, Sydney University, who have materially assisted in this work by collecting specimens in many localities.

Material of the new species and varieties herein described has been sent to the following institutions: The National Herbarium, Botanic Gardens, Sydney, N.S.W.; The Department of Agriculture, Burnley, Victoria; The National Herbarium, Royal Botanic Gardens, Kew, Surrey, England; The Imperial Mycological Institute, Kew, Surrey, England; The United States National Herbarium, Washington, U.S.A.; Botanisches Museum, Berlin-Dahlem, Germany.

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